NOTE X.

CONTRIBUTIONS TOWARDS THE KNOWLEDGE OF THE ANNELIDA POLYCHAETA.

BY

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II [1]).

On *Arenicola*-specimens from the Gulf of Naples.

(Plate 3).

Some time ago a finely preserved collection of Annelids was procured by our Museum from the Zoological Station at Naples; among them I observed some specimens of *Arenicola*, which in their characters do not agree with the species, hitherto known from the European coast. Going over the litterature about this genus, I saw that not only there reigns a good deal of confusion in the description of the different species, but that we want even an accurate knowledge of the feature of the bristles and branchiae of our European species. Almost all the authors have given an erroneous account of the appearance of the branchiae of the common *A. marina*; nevertheless Williams [2]) in the year 1851 already stated: »they are commonly described as forming an arborescent tuft; the division of the vessels is however regulated by a fixed principle. When fully injected with blood, the vessels of each branchia form a single plane etc." Even a superficial examination is able to convince us of the correctness of Williams' assertion, though his drawing is not very accu-

1) For Part I see Vol. VIII, p. 157.

2) On the British Annelida; Report of the British Association for 1851, p. 195, pl. 4, fig. 13.

rate. Indeed each branchia of the common lug-worm consists of about 12 secundary branchiae, connected by a membrane at their base and situated next to each other in the same plane, like the divisions of a palmated leaf; these secondary branchiae are not irregularly branched, but possess a middle axis, furnished on each side with 3 or 4 tufts of filaments (fig. 2).

If the number of those lateral tufts much increases, as is to be observed in some species of *Arenicola*, and the middle axis bears on each side, in stead of 4, 12 or more racemous tufts, the secondary branchiae resemble a feather (fig. 6). Therefore a South-American species, provided with such plumous branchiae, was named by Lütken *Pteroscolex*, which he wishes to be considered as a sub-genus of *Arenicola* [1]). However if we would retain this name, as proposed by Levinsen [2]), then also our *A. marina* ought to be ranged in that sub-genus, because there is only a gradual difference between the branchiae of *A. antillensis* and *marina*. Claparède seems not to have rightly understood Lütken's description; otherwise he would not have written [3]): »toutes les branchies sont disposées dans un même plan, comme les nervures d'une feuille, et ne forment pas de buisson touffu. Ce caractère a été relevé chez une Arénicole des Antilles par M. Lütken etc."

Branchiae, which are really arborescent, are to be met with in *A. Grubii* (fig. 12), probably also in *A. branchialis*, *Boeckii* a. o.; in those species the branchiae are branching directly at their base, and no real secundary branchiae or branchial leafs are formed.

Arenicola Claparedi Levinsen (fig. 1 and 1*a*). — loc. cit. p. 137, note; *Arenicola marina* L. var. *minor* Clprd. — loc. cit. p. 40, pl. XIX, fig. 3.

1) En ny vestindisk Sandorm, *Arenicola* (*Pteroscolex*) *antillensis* Ltk.; Vidensk. Meddelels. fra Naturh. Forening i Kjöbenhavn, 1864, p. 120.

2) System.-geogr. Oversigt over de Nordiske Annulata, ibidem, 1883, p. 137.

3) Les Annélides Chétopodes du Golfe de Naples, 2e Partie, p. 41.

In the Gulf of Naples a species of *Arenicola* is to be found, which in the number of its setigerous and branchiferous segments agrees with our northern *A. marina*, but in its other characters shows too much differences, to be identified with this species.

Claparède seems to have already presumed this, for he writes: »une étude comparée plus approfondie ne révélera-t-elle pas des différences spécifiques entre les individus de la mer du Nord ou de l'Océan et ceux de la Méditerranée?" However Levinsen has been the first, who considered the Mediterranean specimens to be specifically different from the northern form and named it *A. Claparedi*; he also pointed out some characters by which this species is distinguished from *A. marina*.

The only specimen I could examine has a length of 75 m.m., the caudal region measuring 6 m.m.; on the contrary our *A. marina* attains sometimes a length of 250 m.m. This agrees with Claparède's statement: »mais ce sont de véritables pygmées relativement aux Arénicoles du Nord. La longueur moyenne des adultes mûrs est de six à sept centimètres." *A. Claparedi* resembles *A. marina* in the presence of 19 setigerous segments, of which only the posterior 13 are provided with branchiae; I do not understand how Levinsen can write about this species: »gjaeller findes paa 12—13 ringe", for all naturalists, who examined this worm, agree with each other in this point. It is true, Pennant [1]) as well as Dalyell [2]) have figured *A. marina* only with 12 pairs of branchiae, but we have no doubt that the drawer has overlooked the first pair of branchiae on the 7th segment, which is much smaller than the others; for we read in Dalyell's description p. 136: »thirteen pair of beautiful vermilion branchiae rise from the back."

1) British Zoology; copied in the Encyclopédie méthodique, Vers, pl. 34, fig. 16.

2) The powers of the Creator, Vol. II. pl. XIX, fig. 1.

In *A. Claparedi* the branchiae are generally more developed as in *A. marina*, and the first pair of them, though not so large as those of the middle body-segments, are rather large. The branchiae consist of about 18 branchial leafs, situated in the same plane, and connected at their base by a common membrane; each branchial leaf bears on its sides about six branched filaments, of which the inferior are somewhat longer than those at the tip. The ventral bristles (fig. 1) can easely be distinguished from those of *A. marina*; they are characterized by an obvious enlargement, serrated at its convex side beneath the hook-like curved tip (fig. 1*a*). In *A. marina* the ventral bristles are not quite smooth as commonly described by the authors, but they show at the convex side one or more faint serrations (figs. 3 and 4). The dorsal bristles resemble those of *A. marina*, which have been accurately described and figured by Grube. Their distal portion is furnished along one side of the shaft with numerous short hairs, giving it a finely serrated appearance, whereas the other side is provided with a narrow membrane. Probably this membrane is composed of hairs, lying densely near each other, for examined with a high power it shows faint, transverse lines and a serrulated edge (fig. 5).

Levinsen gives the following characteristics of *A. Claparedi*: »branchiae, which are connected at their base only by a very short membrane, stretched, with 10 pair of branches; dorsal bristles with very faintly developed hairs, ventral bristles with more acutely pointed, somewhat separated tip. The branchiae, as stated afterward, agreeing in their structure with those of *Pteroscolex antillensis*, above referred to." Though this description does not quite agree with my own observations, nevertheless I hesitated to propose another name. Perhaps he confounded with *A. Claparedi* individuals of the following species, which possesses branchiae, agreeing in structure with those of *A. antillensis*.

A. cristata Stimpson (figs. 6—11). — Proceed. Boston

Society of Nat. History, Vol. V, 1856, p. 114; *A. antillensis* Lütken, loc. cit.

Among the *Arenicola*-specimens of Naples there are two individuals, agreeing with *A. marina* in feature and size of the body, but plainly distinguished from it by several characters. The number of setigerous segments is only 17, of which the posterior 11 are provided with branchiae. The first branchiae, situated on the 7th segment, as in *A. marina*, are less developed than the following. The branchiae consist of about 12 branchial leafs, situated next to each other in the same plane, but scarcely connected by a membrane at their base; each branchial leaf has a long middle axis and a great number (to 20) of short, branched filaments on each side, resembling a feather. The bristles of the dorsal fascicles have about the same length as those of *A. marina*, but they are more numerous and darker coloured; they are arranged in two distinct transverse rows, the bristles of the posterior row being twice as long as those of the anterior one. The bristles are more hairy as those of *A. marina*; the transversely striated membrane along the distal portion of the bristles in this species, is substituted here by a broad row of distinct hairs, and also along the other side of the bristle short hairs are to be found (fig. 9). The anterior two setigerous segments seem to want the ventral fascicles, at least they are not visible externally. The ventral bristles are slender, with a more or less curved tip; at a short distance beneath the tip they are a little enlarged and furnished at the convex side with a great number of faint serrations (figs. 7 and 8).

The proboscis is covered over its whole surface with large rounded, triangular papillae.

Length of the largest specimen 230 m.m.; length of its caudal region 85 m.m.

A. cristata, described by Stimpson from the shore of Maurice-Island (South Carolina), seems to agree in its main characters with our specimens; therefore, though Stimpson

gives no figures or detailed descriptions of bristles or branchiae, I believe our specimens are referable to this species. It seems to me very probable that *A. antillensis*, accurately described by Lütken, may be identical with *A. cristata*; that the former species has a wider geographical distribution is already stated by Ehlers (Florida-Annelida, p. 173) who mentions it from the coast of Florida. Lütken seems not to have known Stimpson's description, at least he does not mention it. His *A. antillensis* is characterized in the following manner: »annulis setigeris 17, anterioribus 6 ebranchiis, ceteris branchiferis, branchiis e foliis plumiformibus c. 15 compositis, fasciculis filorum respiratoriorum ad latera trunci mediani collocatis plumas singulas formantibus; annulis caudalibus 8 nudis (sine setis et branchiis), papilliferis.

Longitudo usque ad 0.35 M. Hab. ad oras Ins. Antillarum."

There is only one character in Lütken's description, that is open to doubt; this is the presence of long, projecting papillae at the ventral side of the caudal region, which are identified by Levinsen with branchial filaments. Ehlers, however, makes no mention of those papillae.

Two other small specimens of *Arenicola* are to be mentioned, which agree with this species in the number of setigerous and branchiferous segments, but which present some other different characters; therefore I am somewhat dubious if they should be considered either as immature specimens of *A. cristata* or as another species. The largest specimen has only a length of 60 m.m., its caudal region measuring about 12 m.m. The branchiae consist of 10 to 12 branchial leafs, not connected at their base; they are not so slender as those of the larger foregoing specimens, their inferior filaments being more branched and longer as those of the tip. The dorsal bristles are not so hairy and resemble those of *A. marina* (fig. 11). The proboscis is densely covered with acute, conical papillae; only at the base there is a region of about 5 series of obtuse triangular papillae.

Arenicola Grubii Clprd. (figs. 12—15). — Claparède, loc. cit. p. 36, pl. XIX, fig. 2*B*, 2*I*.

This species seems to be very common in the Gulf of Naples, for among thirty *Arenicola*-specimens from this locality, which I could examine, twenty-five belonged to *A. Grubii* [1]). Grube first met with those worms at the shore of Catania; therefore Claparède, who found them afterward at Naples, named the species in honour of that distinguished investigator of Annelids *A. Grubii*. It is to regret that a singular mistake seems to have crept into Claparède's description, for we read there: »segmentis anticis branchiis destitutis decem" and afterward »dans l'espèce napolitaine, la première paire de branchies est toujours au dixième sétigère" [2]); however those numbers are quite at variance with the description of Grube, who writes: »ich zählte 38 paar Borstenbündel, von denen die ersten 11 isolirt, die übrigen 27 mit Kiemen zusammenstanden." The exactness of Grube's statement could be confirmed by me, for I found the first pair of branchiae without any exception situated behind the 12th dorsal bristle-fascicle. The largest specimen has 38 setigerous segments. The first pair of branchiae is not smaller as those of the following segments; however in the posterior region of the body the branchiae gradually decrease in size, and the posterior segments want them totally, or they are only represented by a small filament with a couple of short branches. The branchiae do not consist of secundary branchial leafs, but are arborescent, branching directly at their base; they show 3 or 4 main stems, which divide dichotomously and terminate in numerous filaments. The dorsal fascicles con-

1) By the liberality of Prof. Hubrecht the *Arenicola*-specimens of the Utrecht Museum were also placed in my hands for examination.

2) This erroneous description is repeated in Carus' Prodromus Faunae mediterraneae; it is an example to illustrate the dubious valour of such a catalogue drawn up without any critic; had the author could limit himself to a simple enumeration of the species and the litterature, his work should have been less painful for himself, and as useful for the public.

sist only of a small number of bristles; those are rather smooth, a narrow membrane along their distal portion is scarcely visible and the tip is covered with some scaly hairs. The ventral bristles resemble somewhat those of *A. marina*, but they are furnished at the convex side of the hook-shaped tip with a secundary tooth, behind which some faint serrations are visible (fig. 13); Claparède has recognized this character, but his figure is not very correct. In this species the ventral bristle-fascicles of the anterior body-region are not much smaller as those of the posterior branchiferous region, like in the foregoing species, but they have about the same dimension, and reach nearly to the median ventral line; whereas f. i. in *A. marina* the 5th ventral fascicle contains about 20 bristles, in this species the number of them will amount to about 100.

The proboscis is covered with acute conical papillae; only at its base there are about 5 series of large and more obtuse ones.

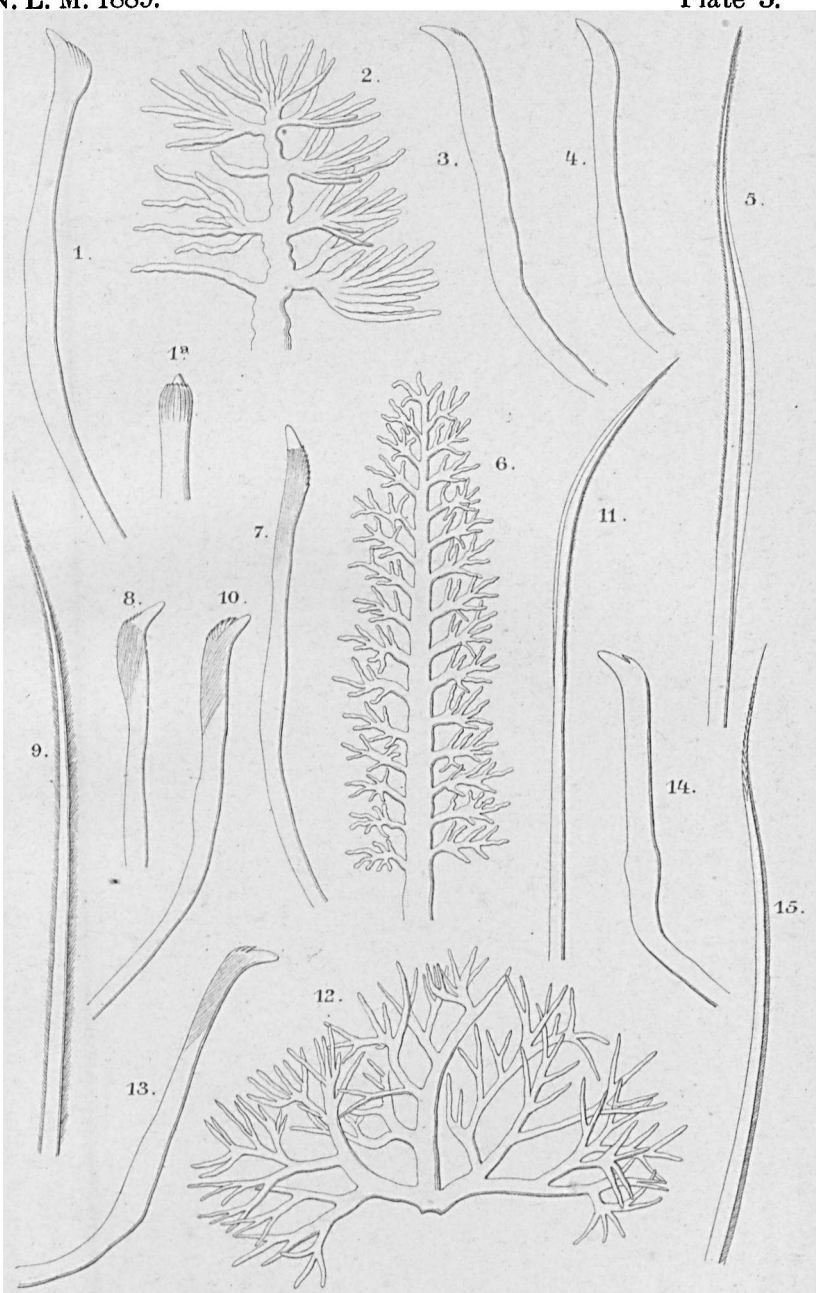
From Prof. Oliveira of Coimbra I received for identification an *Arenicola*-specimen from la Granja (Coast of Portugal); this specimen agrees in many regards with *A. Grubii*, therefore I am not inclined to base a new species upon it. The worm has a length of 105 m.m., but it wants a portion of the posterior region. There are 34 setigerous segments. The branchiae agree in their feature with those of *A. Grubii*; the first pair of them is also situated on the 12th setigerous segment, but is not so developed as in the last species. The bristles show some small differences; the dorsal bristles have an obvious membrane along their distal portion (fig. 15) and the ventral ones have only a single tooth without serrations behind (fig. 14). Perhaps it may be considered as a local variety of *A. Grubii*.

EXPLANATION

OF

Plate 3.

Fig. 1. Ventral bristle of *Arenicola Claparedi* Levins. (alcoh. spec.). × 175 diam.
Fig. 1*a*. Tip of the foregoing, surface view.
Fig. 2. Branchial leaf of *Arenicola marina* L. (alcoh. spec.). × 20 diam.
Fig. 3. Ventral bristle of the same, XIXth fascicle. × 90 diam.
Fig. 4. Ventral bristle of the same, Ist fascicle.
Fig. 5. Dorsal bristle of the same. Magnified.
Fig. 6. Branchial leaf of *Arenicola cristata* Stimps. (alcoh. spec.). × 17 diam.
Fig. 7. Ventral bristle of the same, XVIIth fascicle. Magnified.
Fig. 8. Ventral bristle of the same, anterior region of the body.
Fig. 9. Dorsal bristle of the same.
Fig. 10. Ventral bristle of a small specimen of *A. cristata*?
Fig. 11. Dorsal bristle of the same.
Fig. 12. One of the branchiae of *Arenicola Grubii* Clprd. (alcoh. spec.). × 15 diam.
Fig. 13. Ventral bristle of the same. × 175 diam.
Fig. 14. Ventral bristle of a specimen from the Coast of Portugal. × 175 diam.
Fig. 15. Dorsal bristle of the foregoing specimen.



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1, 1a. Arenicola Claperedi *Levins.* 6—11. Arenicola cristata *Stimps.*
2—5. „ marina *Linn.* 12—15. „ Grubii *Clprd.*